

SCIENCE SERVICE NEWS BULLETIN

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The objects of Science Service are to supply current and interesting scientific information to as large a part of the general public as can be reached. The bulletins are not addressed primarily to men of science and might not be in place in the regular pages of SCIENCE. They will, however, prove to be of interest, partly because every one is at most an amateur in the sciences that are outside his own field, and partly because it is one of the objects of science to maintain its relations with the general public on which it must depend for recruits and for support.

It is hoped that the publication of Science Service Bulletins will prove to be interesting and profitable to scientific men and will lead to their cooperation in maintaining high scientific and literary standards in the popularization of science. It should be understood that while the editor of SCIENCE is responsible for the publication of the bulletins, responsibility for the contents rests with the editor of Science Service, Dr. E. E. Slosson, and the editor of the bulletin, Mr. Watson Davis, and in the last resort with the American Association for the Advancement of Science, the National Academy of Sciences and the National Research Council.

MEASURES FEEBLE HEAT STARS SEND TO EARTH

By measuring a hundred millionth degree of temperature and a trillionth of an ampere of electric current, Dr. C. G. Abbot, of the Smithsonian Institution, has determined for the first time the heat spectrum of starlight with great accuracy.

Working with the 100-inch telescope at Mt. Wilson Observatory this fall, Dr. Abbot measured the heat at different parts of the spectrum of ten stars and the sun. The rays were dispersed by a spectroscope in a band similar to the rainbow.

The bright star Capella, which is very similar to our own sun in its spectrum, was found to furnish the equivalent of one horse power to an area on the earth approximately equal to the state of Minnesota. But this prominent star is feeble compared with our sun, which is equal to a hundred billion Capellas and sends down on twenty square feet heat equal to a horse power. On the whole earth Capella's heat equals 500 horse power, and as all the stars together equal 500 Capellas this would amount to 250,000 horse power over the whole earth from the stars alone.

Dr. Abbot explained that his work on the heat of stars, accomplished with the cooperation of L. B. Aldrich of his staff, is an outgrowth of the principal work of the Astrophysical Observatory, which is the investigation of the sun.

"This work was begun about 1890 by Dr. S. P. Langley whose great pioneer work in measuring the sun's heat, its distribution in the spectrum, and the losses and modifications which it encounters in passing through the earth's atmosphere, were classic," said Dr. Abbot.

"It might be supposed that the investigation of a heat source whose in-put on the earth's surface amounts to the equivalent of a horse power per couple of square yards would require only simple and insensitive apparatus, but such is not the case. The complexity of the solar beam, made up of rays of greatly differing wave length which are all differently transmitted by the earth's atmosphere, requires the employment of the spectroscope to separate the rays, and for the recognition of their heat the use of highly sensitive thermometric apparatus.

"The most satisfactory heat instrument for these purposes is the bolometer, invented by Langley about 1880. Two hair-like wires of platinum are placed side by side, the one hidden from the rays by means of a metallic diaphragm, the other exposed in the spectrum. The heat absorbed by the exposed thread, if it be as little as the millionth of a degree, suffices to disturb a sensitive electrical balance, and by a beautiful device introduced by Langley in the earliest years at the Astrophysical Observatory these indications are

automatically recorded from one end of the spectrum to the other. The record takes the shape of a curve which mounts to different heights with reference to its base line, and these heights are proportional to the heat in the various rays of the spectrum. The absorption bands due to the chemical elements in the sun, and those due to some of the elements and compounds of gaseous nature in the earth's atmosphere, are indicated as depressions in this sinuous curve. In this way the effects of the earth's atmosphere upon the sun rays may be determined and allowed for, so that the intensity and quality of the rays as they would be outside the atmosphere, on the moon, for instance, where there is none, can be computed. When this is done, the intensity of the sun's heat freed from atmospheric influences is found to be variable."

The form of distribution of the solar spectrum gives an indication of the temperature of the sun. Just as the blacksmith's iron as he heats it becomes faintly glowing, then a brighter red, then yellowish, then white hot, so the spectra of the sun and other stars depend for the arrangement of the intensities of the different colors upon the temperatures which prevail in these sources of light. The measurements of the Smithsonian Institution indicate a temperature for the sun approximating 6,000 degrees C.

NO SCIENTIFIC BASIS FOR PREDICTING CALIFORNIA QUAKE

THE fact that the earthquake zone in California is analogous geologically to the devastated region in Chile has raised some apprehension here as to the probability of a quake or tidal wave in California.

Since the disaster of 1906, considerable scientific research on the causes of the crust movements on the west coast has been conducted which may eventually lead to definite earthquake predictions.

But Dr. H. O. Wood, in charge of investigations for the Carnegie Institution of Washington, when seen at the Mount Wilson Observatory, said:

"There is no scientific basis for any estimate of probability of an earthquake in California following upon the recent shock in Chile. No indications of any impending shock have been noted here. Sometimes several great earthquakes have occurred in places far distant from one another within a relatively short time interval so as to suggest causal group occurrence but more commonly there is no such apparent grouping in the occurrence of great shocks."

About 150 miles off the coast of California, there is a sharp break in the ocean bottom that is as steep as the east slope of the Sierra Nevadas, according to Dr. William E. Ritter, director of the Scripps Institution for Biological Research, who located it by extensive soundings when he was on the oceanographic expedition of the *Albatross* in 1904. It has been suggested that this is a plane of weakness that might give rise to an earthquake at sea. Such a crustal slip would probably create a serious tidal wave such as that which swept the Chilean coast in the wake of the recent shocks.

But investigations into the history and folklore of the country are reassuring. They indicate that no tidal wave ever swept the California coast, according to Dr. Ritter. There is not even a tradition of sudden encroachment of the sea upon the land.

HOW CHILEAN QUAKE HAPPENED

How Chile's death-dealing earthquake, which shattered cities and engulfed their helpless inhabitants with tremendous tidal waves, originated at sea off the coast of that country, is explained by Dr. W. J. Humphreys, meteorological physicist of the U. S. Weather Bureau, from the seismographic records made by the earth's tremors at this point. For four hours the pen of the highly sensitive instrument drew the picture of the movements in the earth, which wrought such havoc among the Chilean towns in a few minutes.

Earthquakes, Dr. Humphreys said, are produced by a slipping or breaking of the crust of the earth as a result of strains. These strains may be caused by the shrinking of the interior of the earth through temperature changes, changes in loads due to rapid erosion taking material from one place to another in the course of a few hundred years, or from the tendency of higher land to flow out to sea.

From what is known of the present quake, it seems to have been caused by higher land moving out to sea. The actual break in the crust occurred at some distance from shore, and this sudden change in the ocean floor at that point produced a tidal wave. As there were several such waves, there must have been several faults or breaks in the earth's crust at the sea bottom which created the different huge billows in the incompressible water. It is probable that this crack extended for a hundred miles or more and that the wave created was detected in the Philippines or other distant Pacific points.

Breaks, such as caused the shocks and waves